



Building a Regional Biobased Economy: The Canadian Experience

Presentation by Randal Goodfellow to
The Montana WIRED Academy –
August 15th

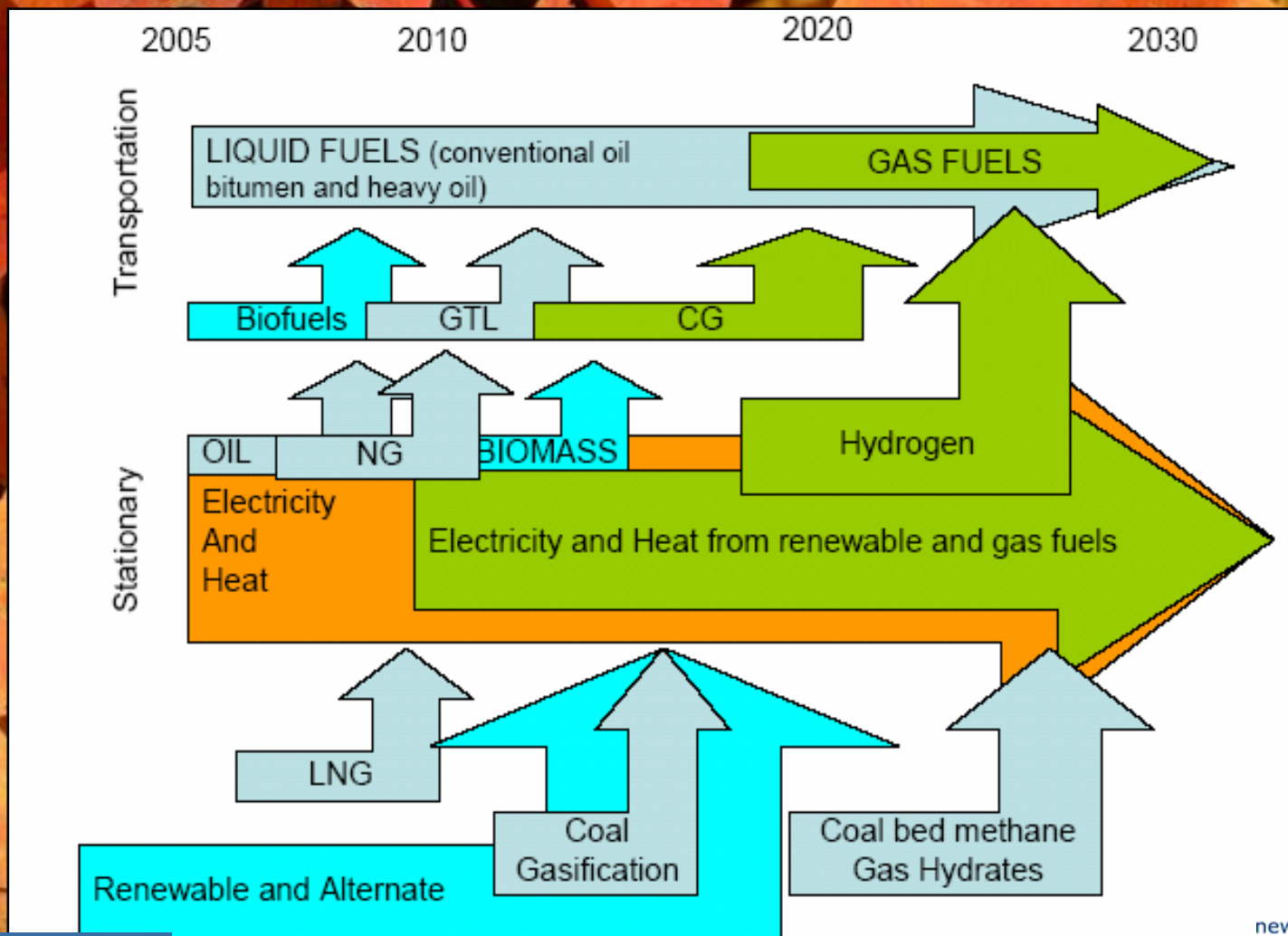
To Be Covered

- Global perspective: APEC Future Fuels Roadmap
- Building the Canadian Story
- BioRefinery the word is everywhere ... what does it mean?
- Real life rural industrial initiatives
- Fundamental questions to move to action

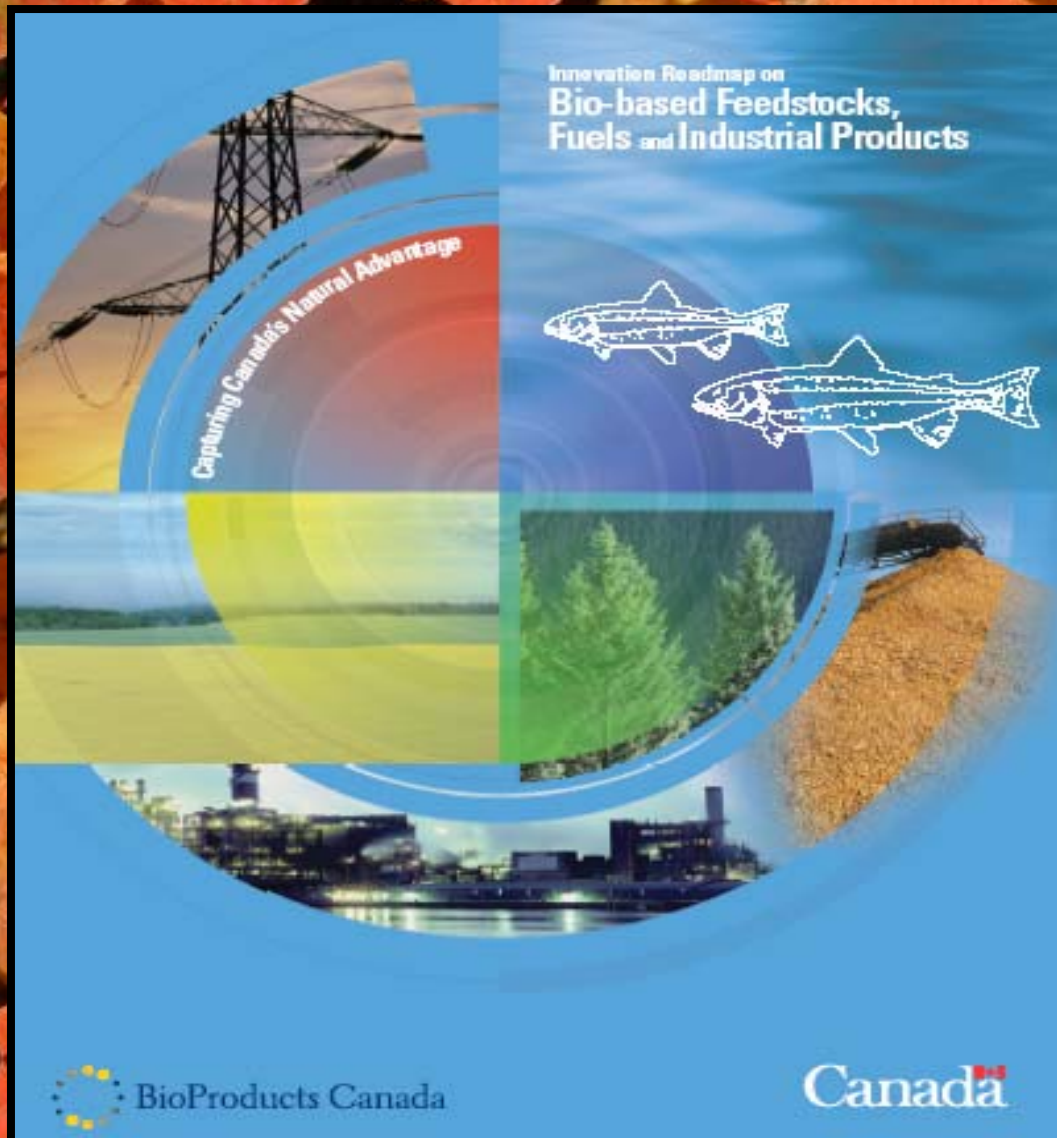
Global Perspective: The Drivers

- Depends on where in the world you are:
- Energy Security
- Environmental Reasons – Climate Change
- Strengthening Agricultural / Natural Resource Sectors
- Economic Development in Rural Areas

APEC Future Fuels Roadmap



Building The Canadian Story

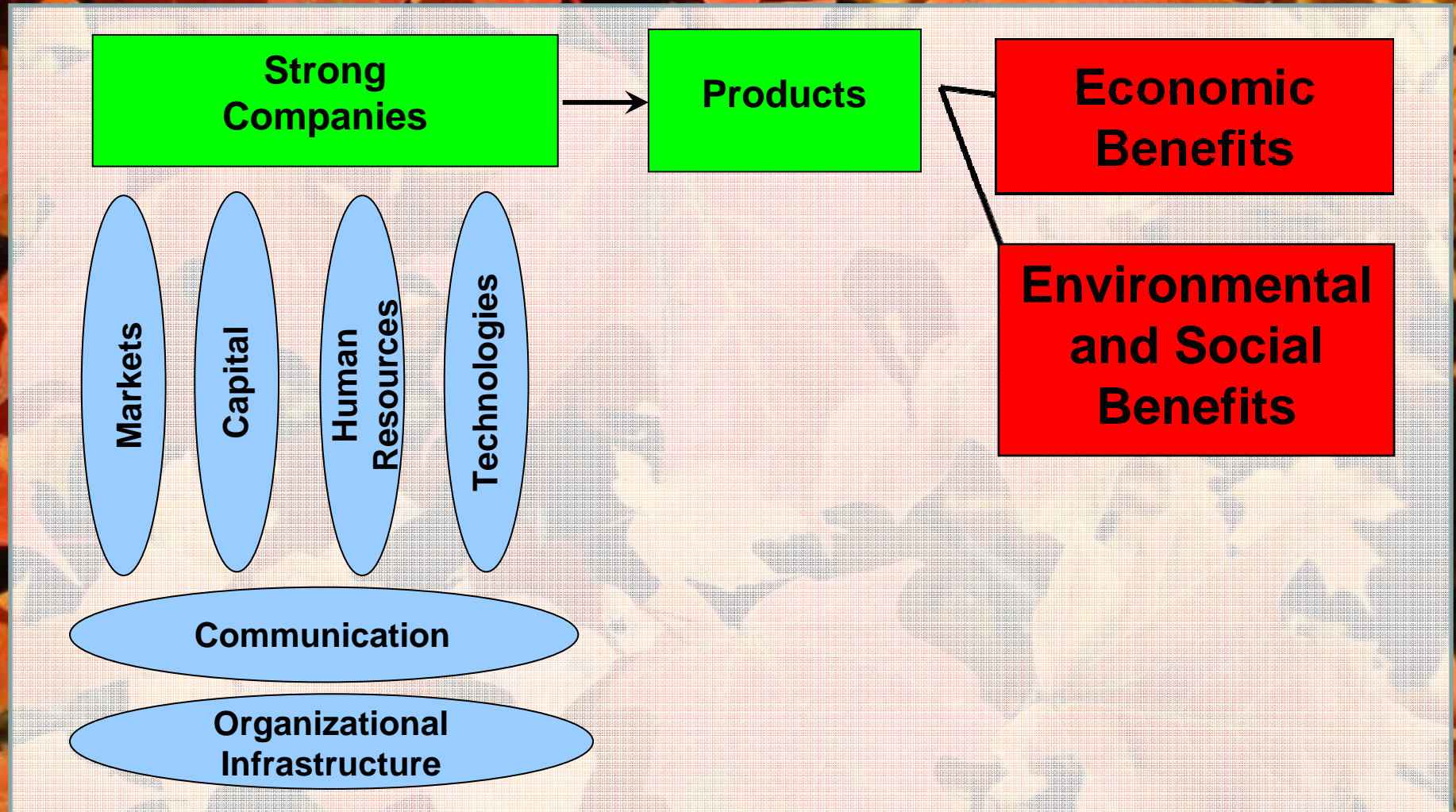


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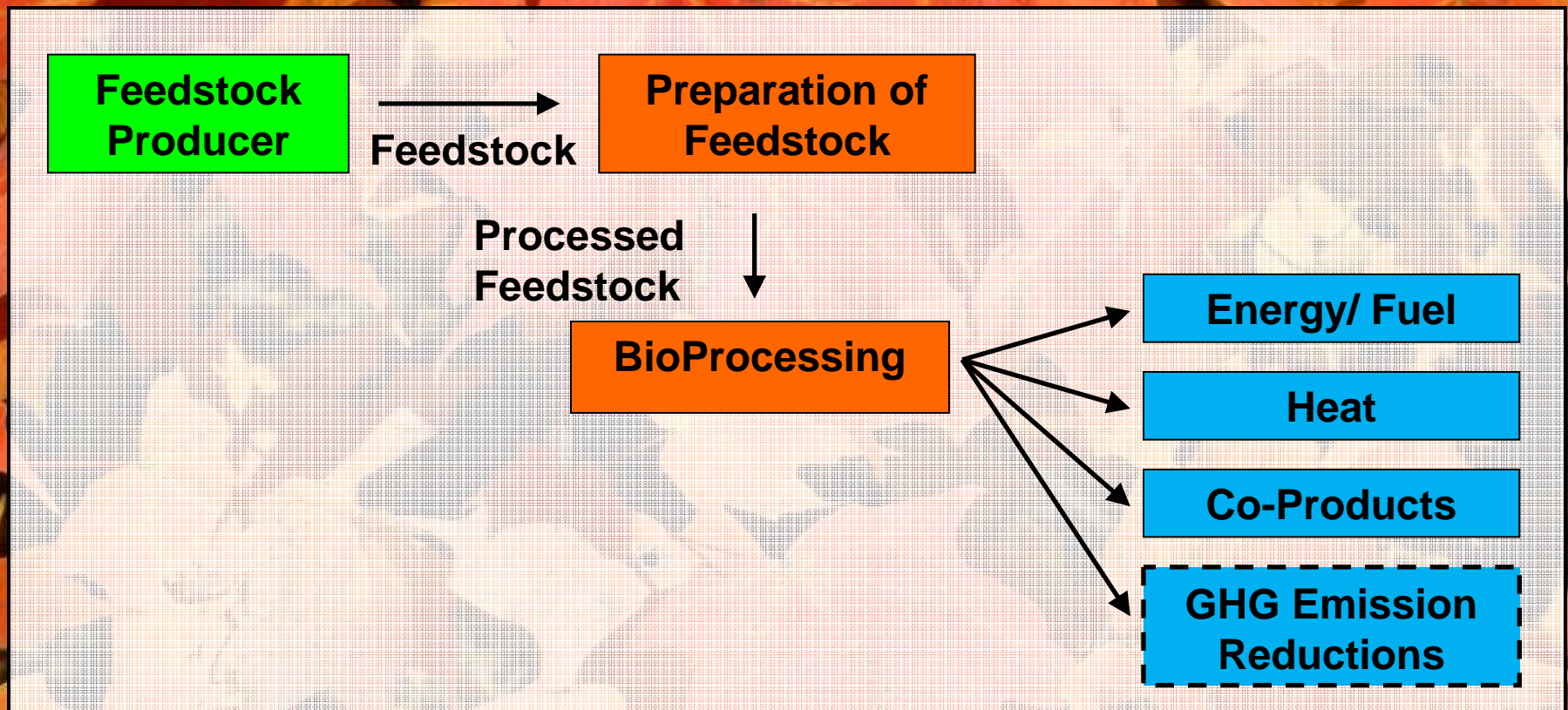
new economy strategies

nes
making the complex simple

Developing a Common Language and Aligning Assets



The Generic Industrial BioProducts Value Chain



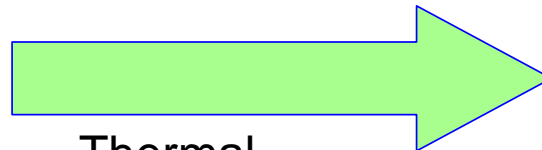
Further Expanded Industrial Bioproducts Value Chain

Renewable Bioresource Feedstock

- Plants
 - crops
 - trees
 - algae
- Animals, fish
- Microorganisms
- Organic residues
 - municipal
 - industrial
 - agricultural
 - forestry
 - aquaculture

Bioprocess Technology

Biocatalysis (Enzymes)
Fermentation (Microorganisms)



Thermal –
**Physical – Chemical
Process Technology**

Extraction
Pyrolysis
Gasification

Industrial Bioproducts

- Bioenergy and Biofuels
- Manufactured products:
 - biochemicals
 - biosolvents
 - bioplastics
 - ‘smart’ biomaterials
 - biolubricants
 - biosurfactants
 - bioadhesives
 - biocatalysts
 - biosensors

Recommendations

Establishment of Sector Development Organizations

Align Research and Training Capacity

Establish Sector Specific Capital Pools

Market Development / Green Procurement

Establish Eco-Industrial Network / Clusters

Recent Federal Bioproducts Initiatives of Note

- Greening of government operations – a procurement strategy
- Agriculture and Agri-Food Canada's (AAFC) Agricultural Bioproducts Innovation Program (ABIP) has \$145M in funding in support of research networks
- AAFC's ecoAgriculture Biofuels Capital Initiative (ecoABC) program provides capital assistance to farmers to become biofuel producers, with \$200M in funding
- AAFC has allocated \$134M for the scale-up of commercially ready technologies for the manufacture of bioproducts and novel food processing

Recent Federal Initiatives ...cont.

- Natural Resource Canada's (NRCan) EcoEnergy program provides \$1.5B to stimulate renewable energy consumption, and \$230M for clean energy technology development
- Sustainable Development Technology Canada is investing very heavily in the bioenergy sector, with over \$1B in funding and \$500 million forthcoming in 2008 dedicated towards support for next generation cellulose to ethanol production facilities
- The National Research Council has announced that bioproducts will be the theme of its first ever national initiative, judging that this is the area where it can make the most profound contribution to Canadians

Recent Federal Initiatives ...cont.

- The joint Environment Canada / NRCan / AAFC Renewable Fuels Strategy announced in Dec. 2006 mandating a 5% threshold level for ethanol in all ground transportation fuels sold in Canada by 2010 and 2% biodiesel in ground transportation and heating oil by 2012
- The Natural Sciences and Engineering Research Council of Canada (NSERC) has allocated \$37M for networks and promising young researchers in the areas of renewable energy, environmental and information technologies
- The 2007 budget allocates \$1.5 billion over seven years for an operating incentive to producers of renewable alternatives to conventional fuels

Recent Provincial Bioenergy Initiatives

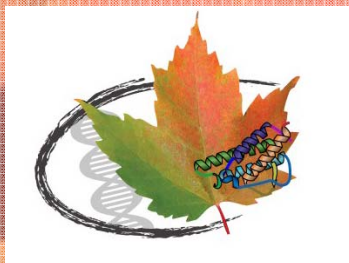
- Ontario requires 5 percent ethanol as of 2007
- Saskatchewan requires 7.5 percent ethanol since 2006
- Manitoba has passed legislation requiring 10 percent ethanol content in 85 percent of the province's fuel, but has not yet set a date for entry into force
- Quebec has set a goal of 5 percent ethanol in gasoline by 2012
- British Columbia has announced it intends to require 5 percent renewable content in diesel fuel by 2010
- Ontario and B.C. have Standard Offer Programs to provide small electricity generators with a standard pricing regime and a streamlined process

Initiatives in Saskatchewan

- Have launched a Climate Change Action Plan
- Are working on a Green Procurement Strategy
- Have launched a Green Initiatives Fund which also includes energy conservation
- New directional approaches are the integration of different renewable energy bio-solar, bio-wind
- Fully appreciating the need for Eco-Industrial Clustering and are doing economic development based upon that approach
- AgWestBio - www.agwest.sk.ca

Initiatives in Alberta

- Money being made in the fossil oil sector finding its way to the renewable sector
- October 2006 Alberta Agriculture – Alberta Energy “Nine-point BioEnergy Plan” announced \$239 million – www.energy.gov.ab.ca/3359.asp
 1. Bio-energy Producer Credit Program \$209 million
 2. Bio-refining Commercialization and Market Development Program
 3. Bio-energy Infrastructure Development Program
- 2006 Triticale BioRefinery Initiative
- 2007 Bio-Fibres Roadmap
- BioProducts Alberta – www.bioproductsalberta.com



ABIP

Canadian
Triticale
Biorefinery
Initiative



NRC-CMRC

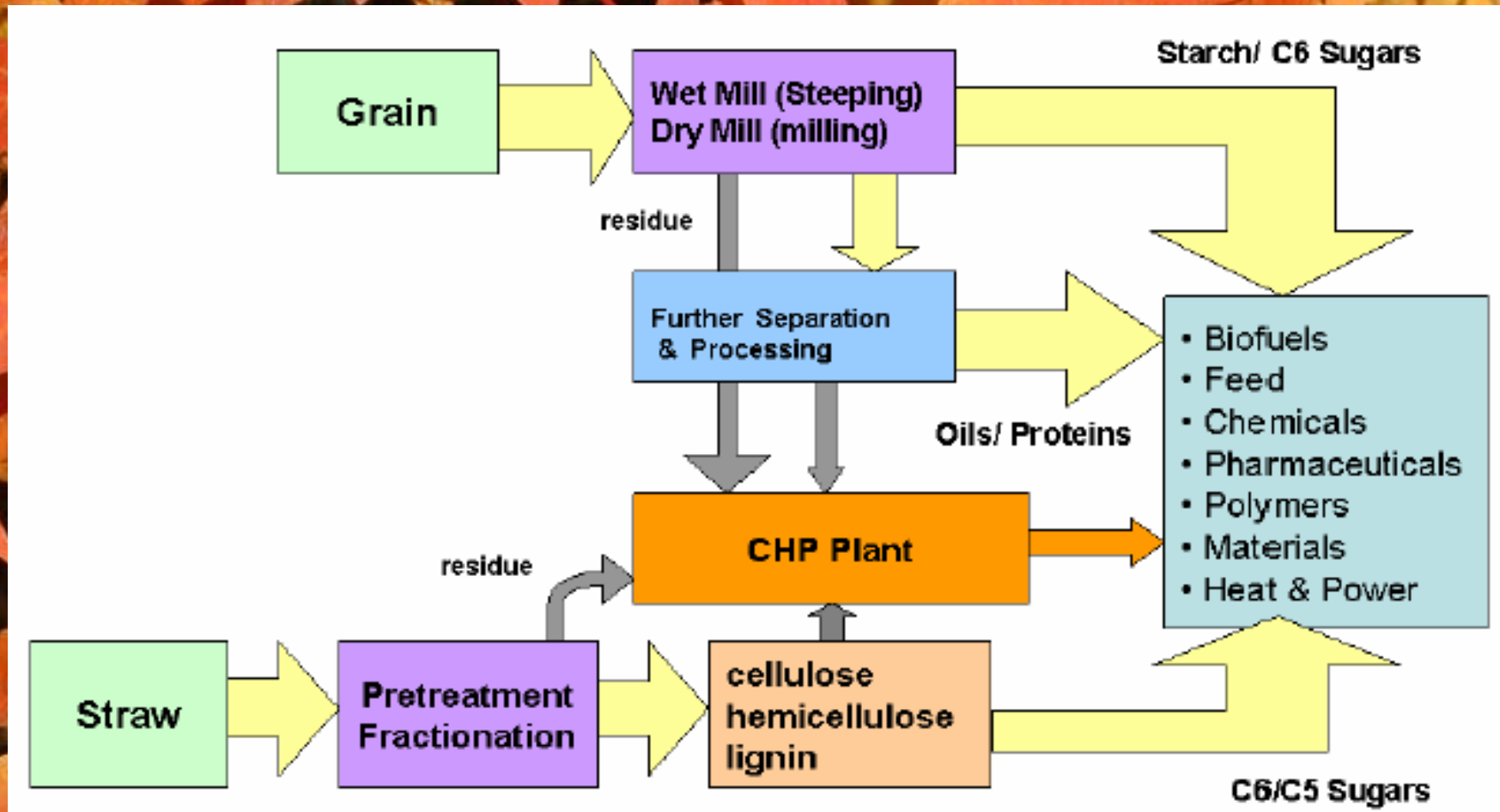
Industrial Bio-oils Biorefinery

NRC-CMRC

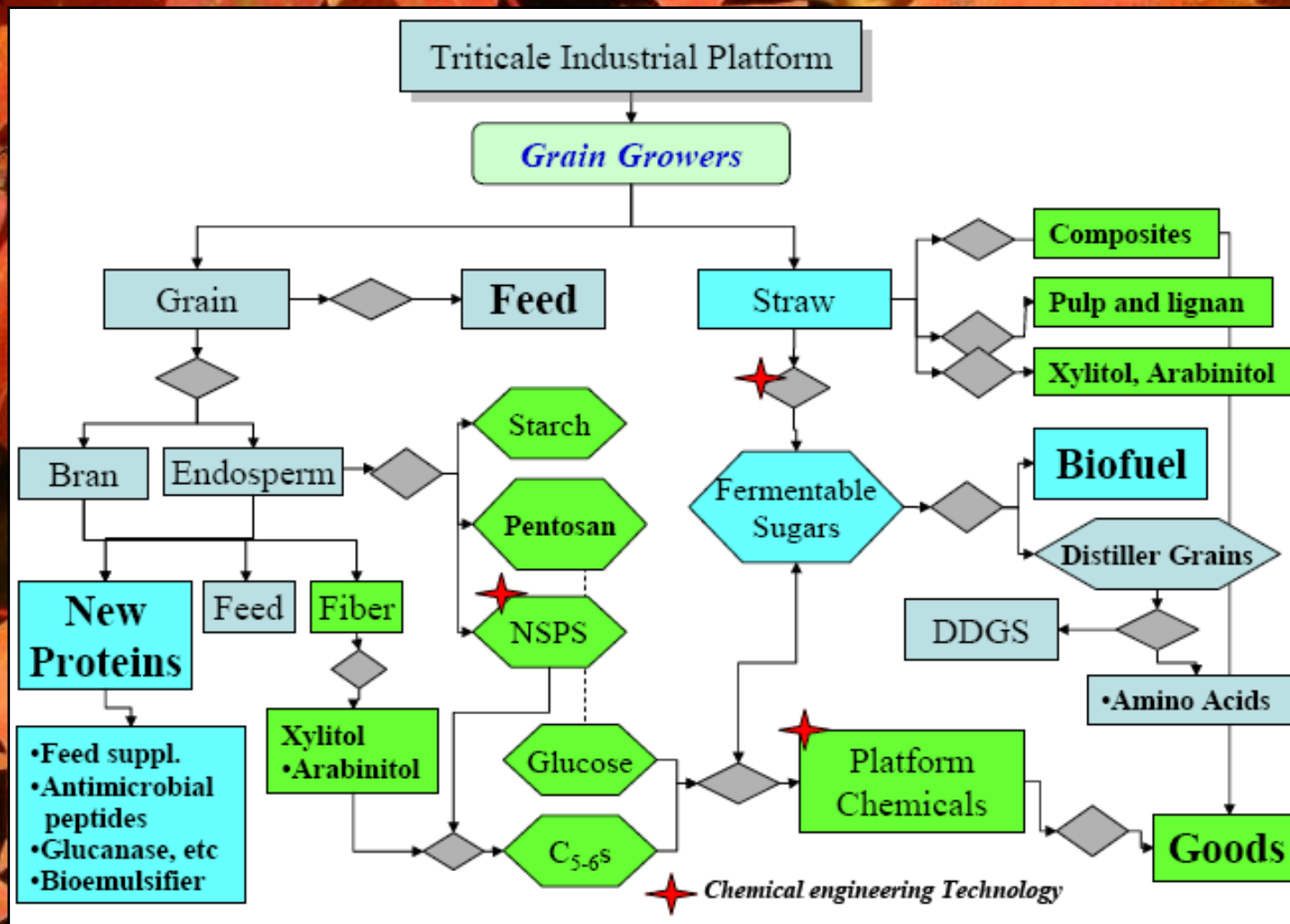
Flax and Hemp Natural Fibre Based
Biorefinery

The term “biorefinery” is
everywhere...what does it mean?

Making Use of the Whole Plant



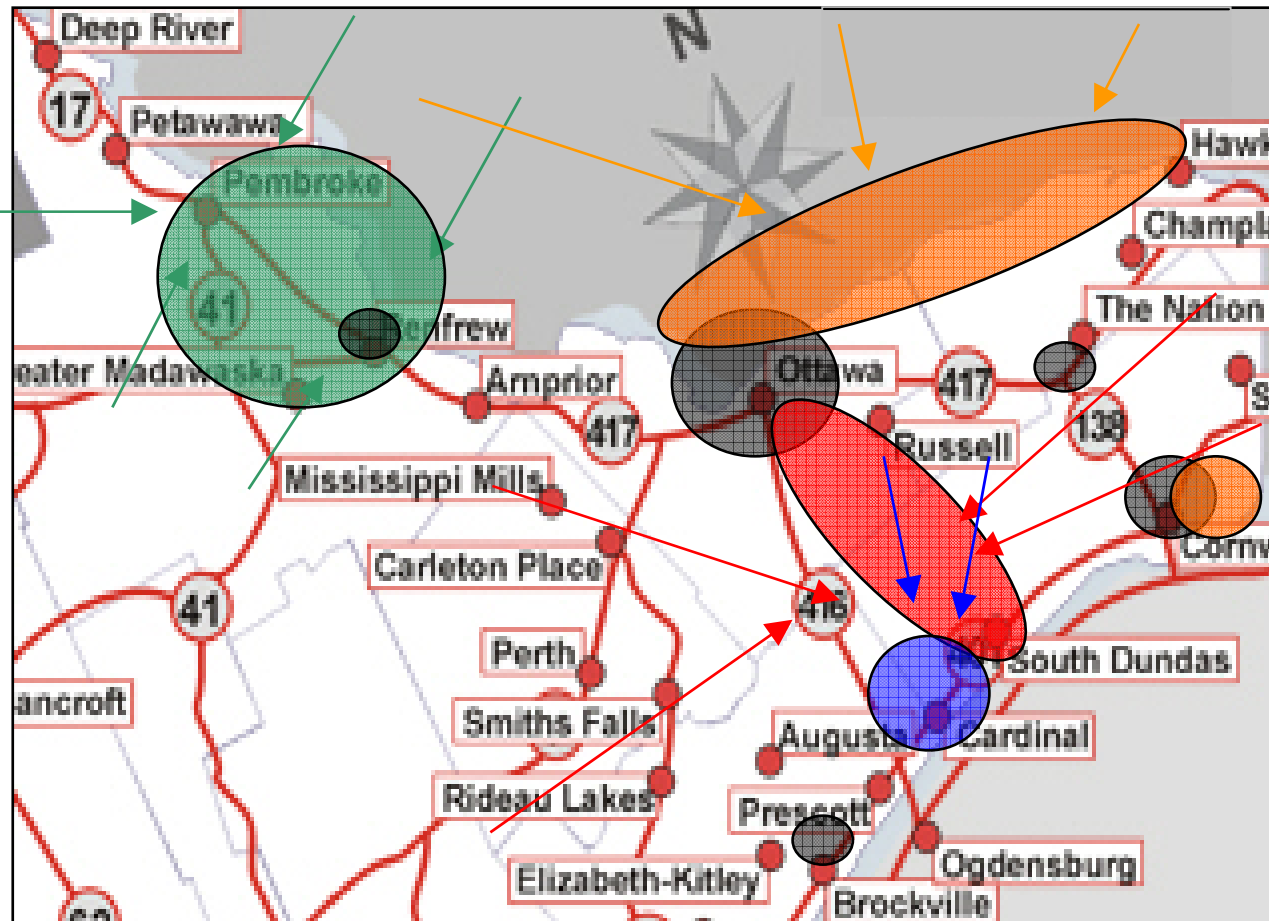
Canadian Triticale Biorefinery Initiative (an Alberta led project)



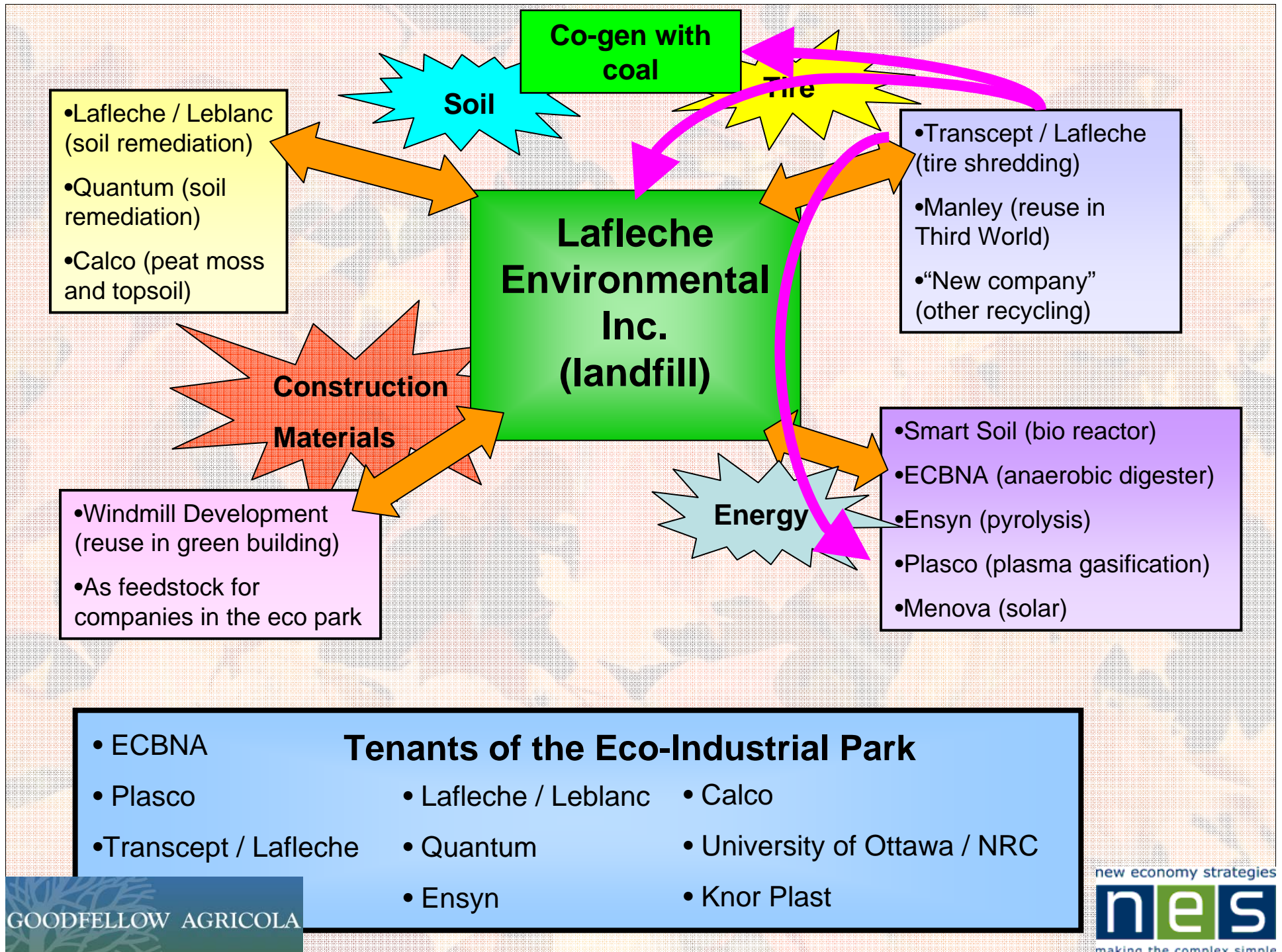
Real Life Rural Industrial Initiatives

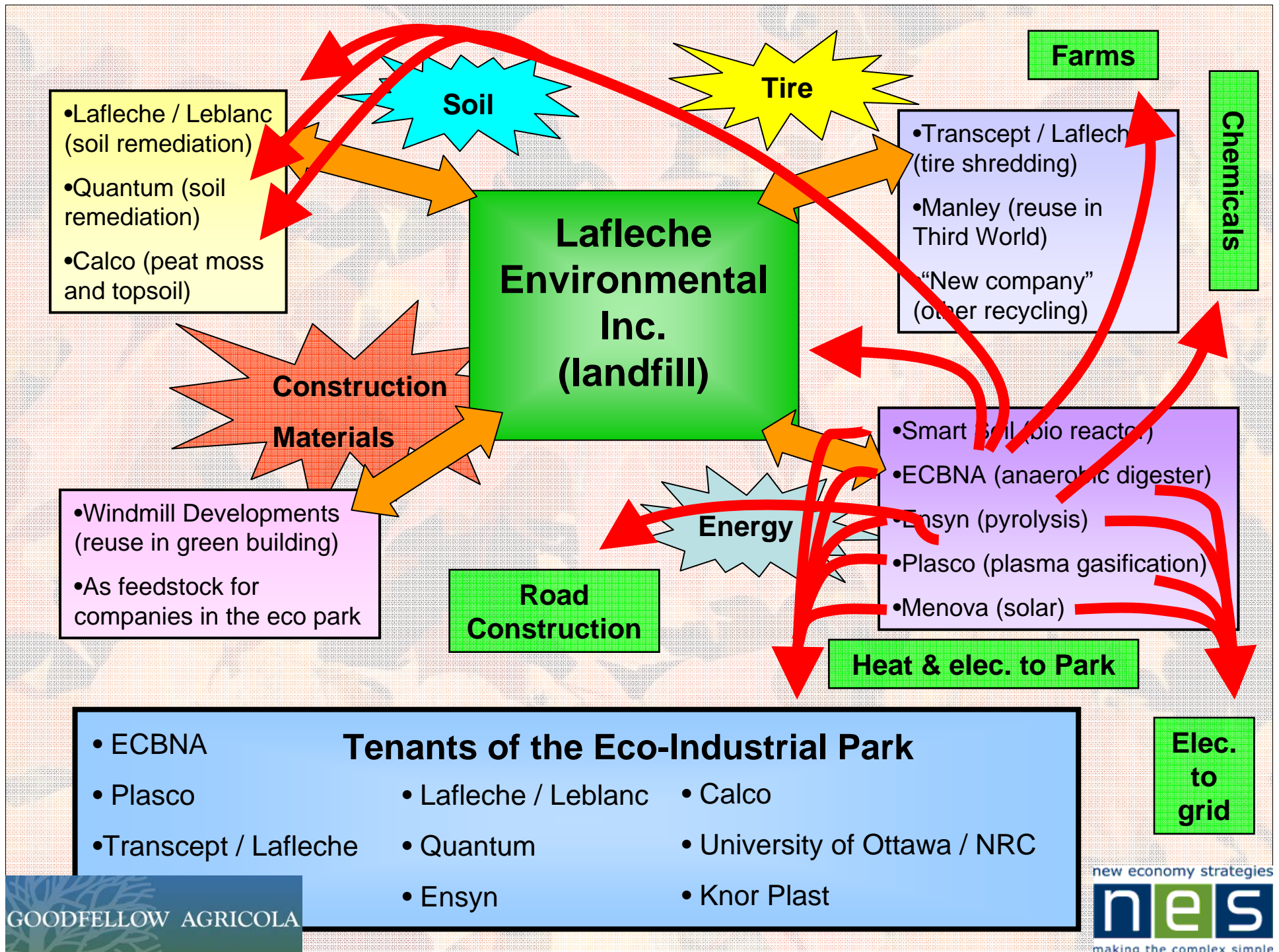
- Lafleche Environmental – outside of Moose Creek, Ontario, Population 400
- Ensyn Technologies – Renfrew, Ontario; Population 7,800
- North Grenville Bioproducts Strategy – Kemptville, Ontario; Population 4,000
- Hot off the press – Legacy cellulose remaining from defunct pulp operation – Hawkesbury, Ontario; Population 10,900

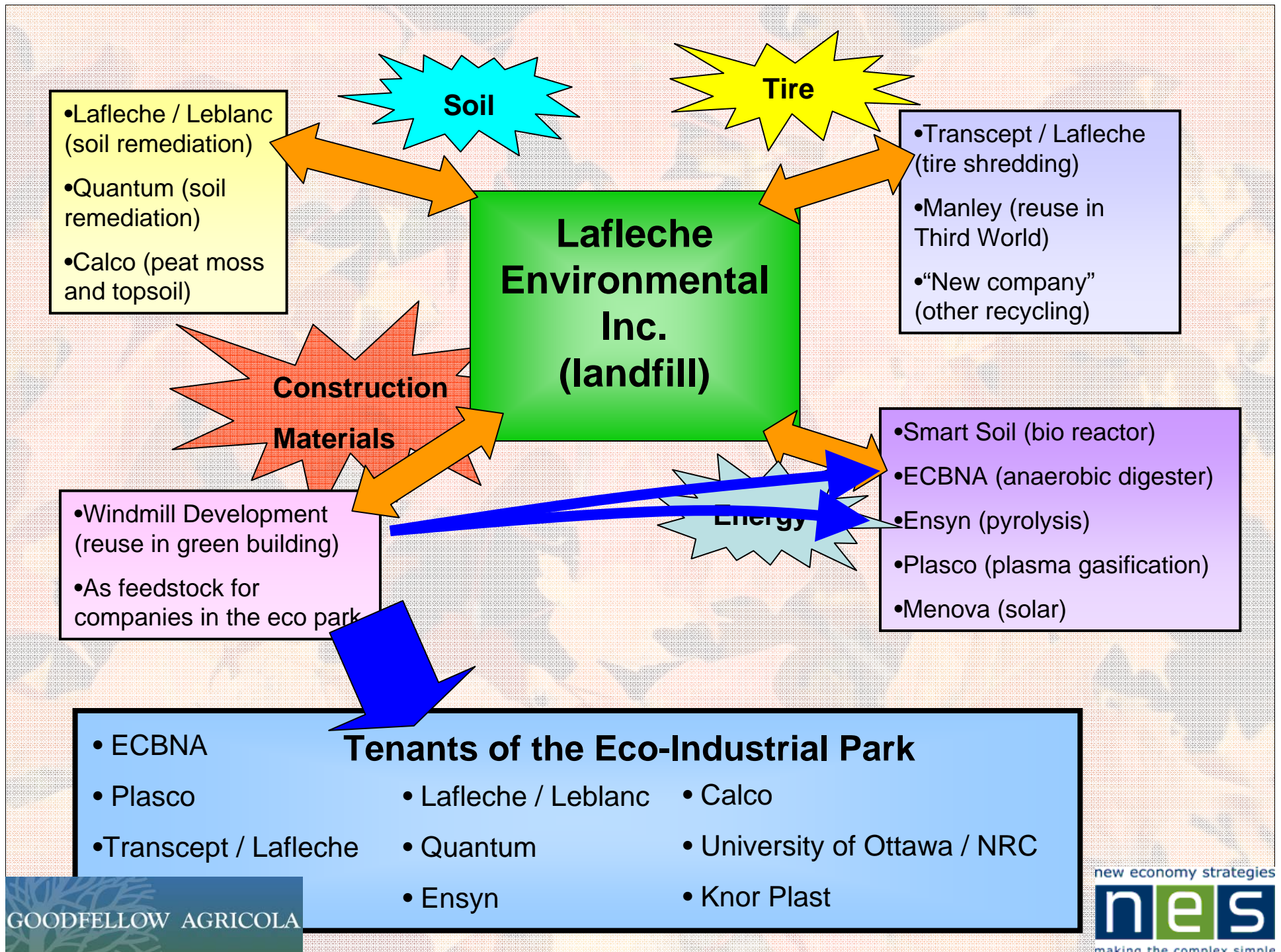
Sheds and Amalgamation

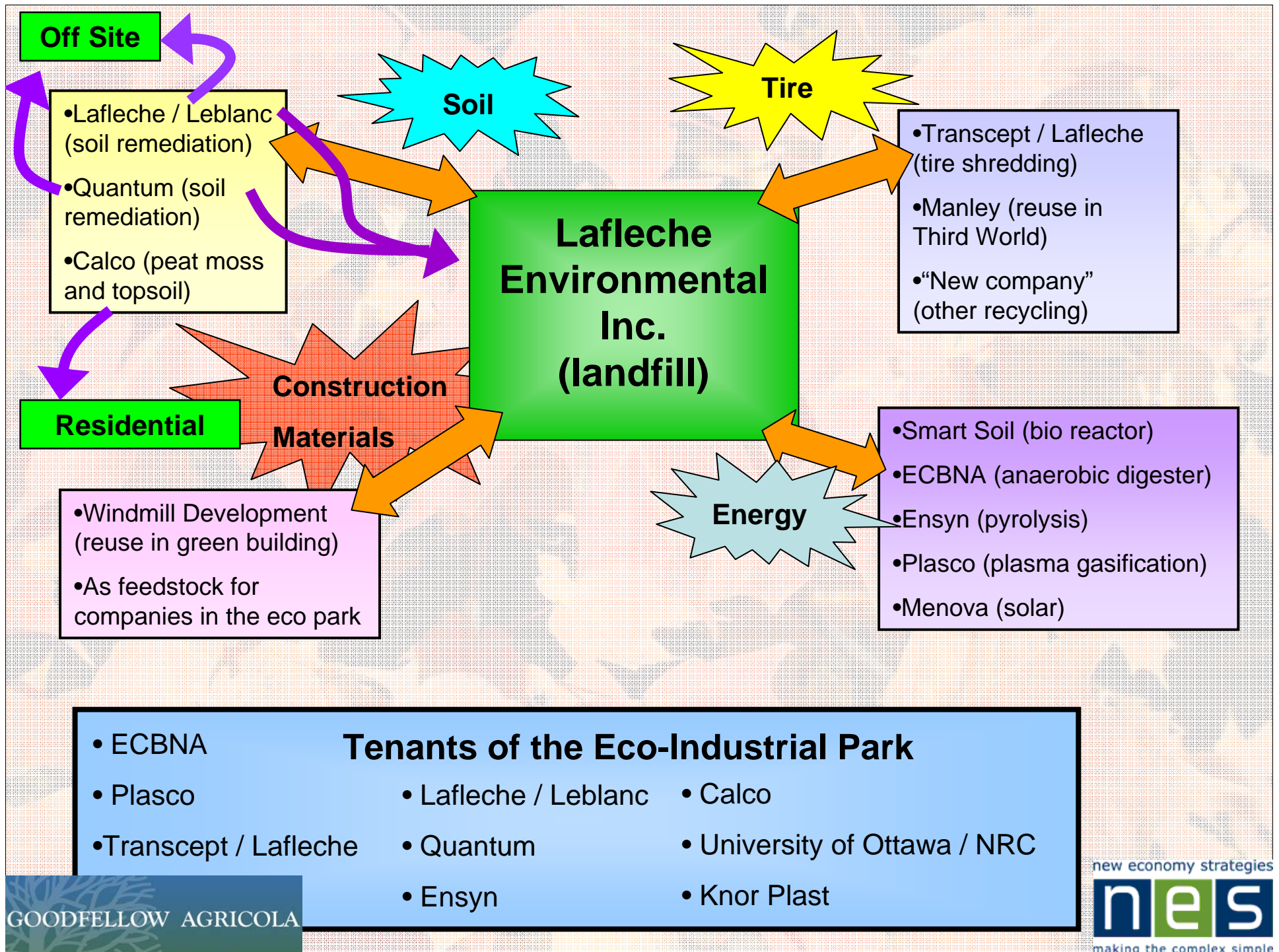


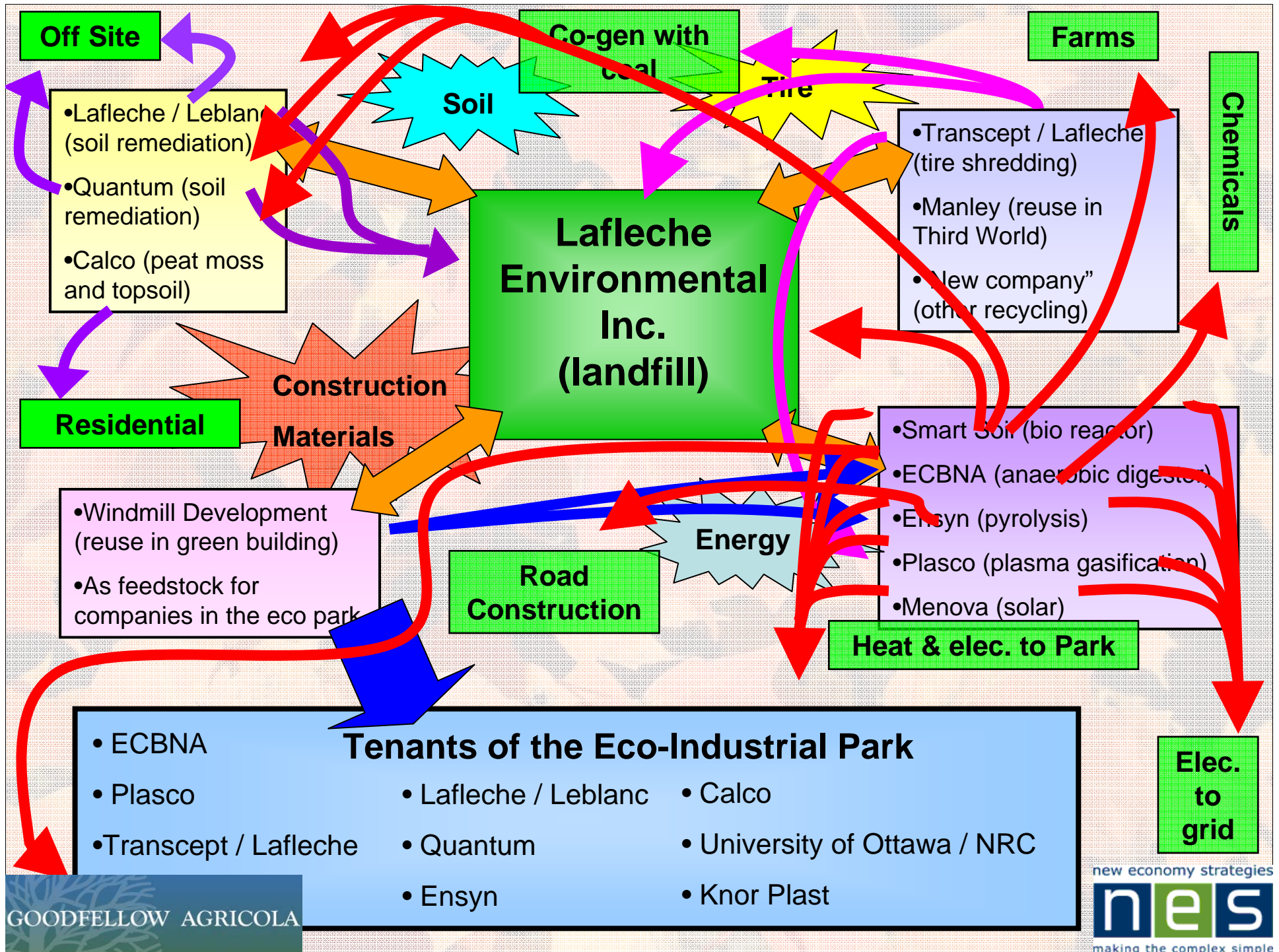
- Timber
- Landfill/
Biosolids
- Wood Pulp
- Milk
- Corn













ENSYN

Biomass Refinery – Renfrew Ontario

100 Dry TPD



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new economy strategies

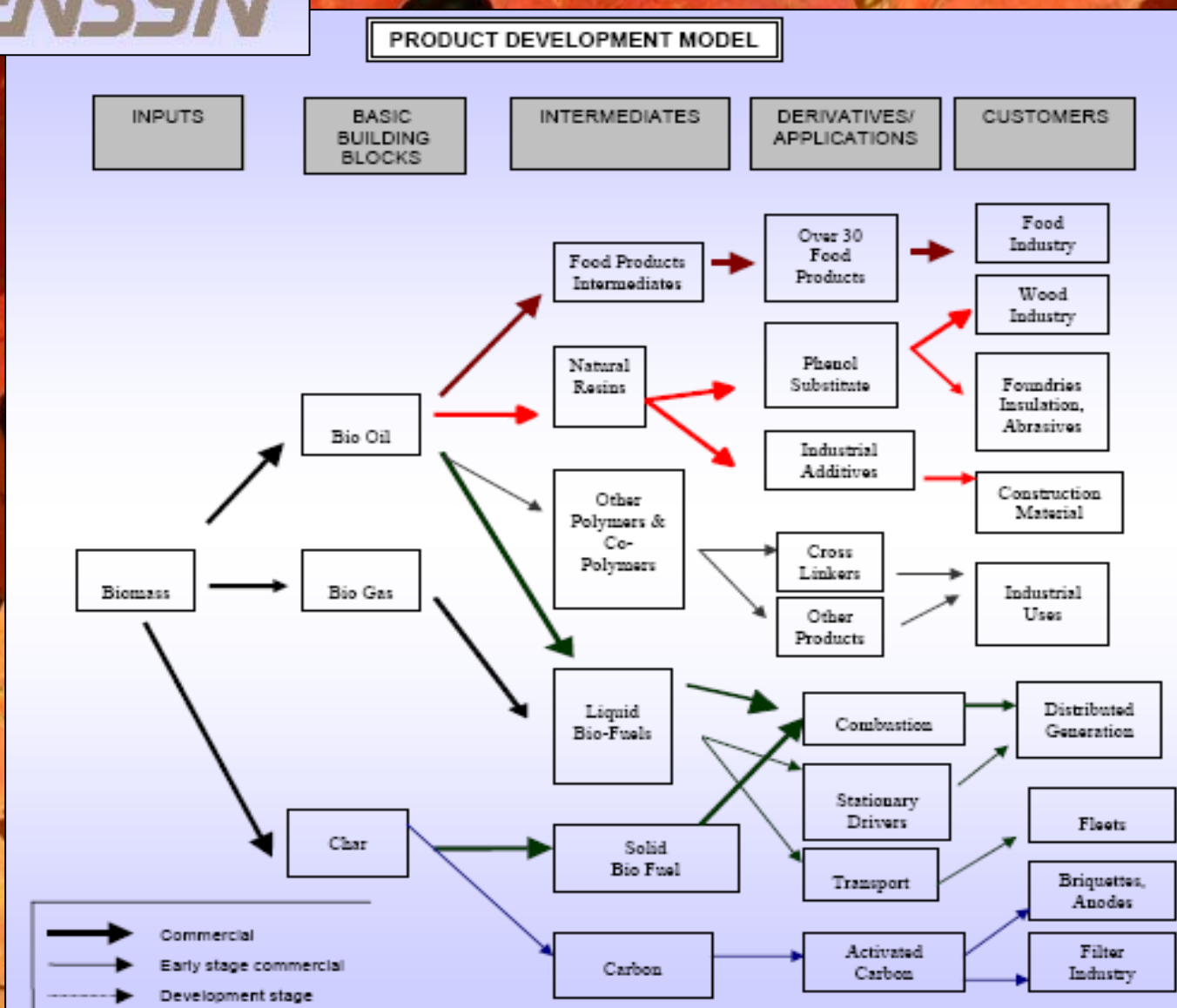
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making the complex simple

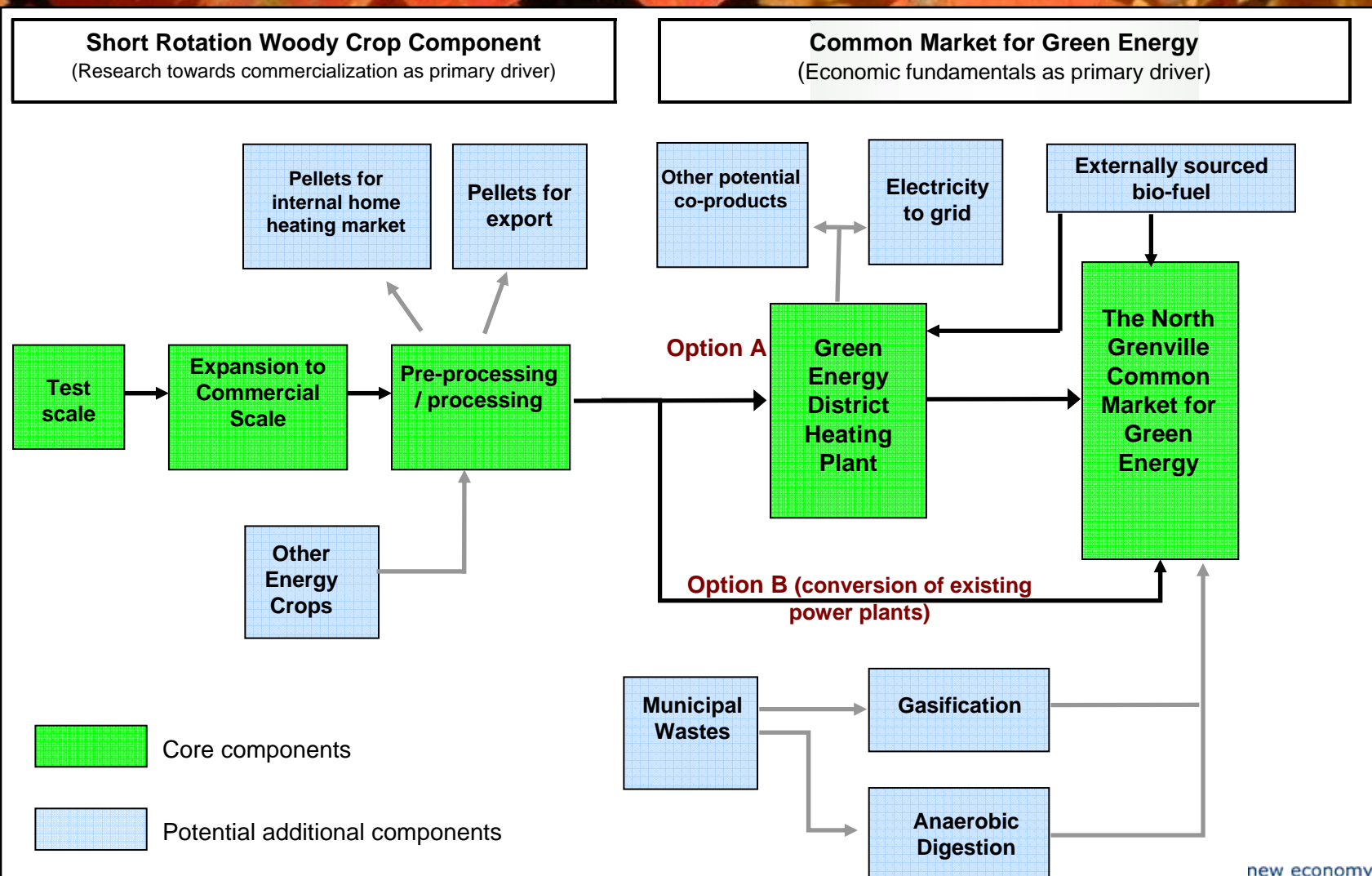


ENSYN

PRODUCT DEVELOPMENT MODEL



The North Grenville Integrated Green Energy Initiative



Hot Off The Press

- CIP Pulp Mill, which was operating in the middle of town, closed 25 years ago
- 300 000 tonnes (on a dry matter basis) of cellulose material was left behind in sludge ponds in addition to chemical and heavy metal contamination of the original factory site

Hot Off The Press ...cont.

- On the edge of a scenic and important river
- Challenge – how to clean it up and redevelop economically, i.e. how to get value out of the cellulose

Fundamental questions to move to action

1) Biomass

- what is it?
- how much is there?
- what condition is it in?
- where is it?
- what is the cost of obtaining it?

Fundamental questions to move to action ...cont.

2) Markets

- your region
- distance to other markets

3) Existing infrastructure

- transportation
- existing manufacturing capacity
- support organization infrastructure

Fundamental Objective

- Determine what is probable versus what is theoretically possible, so that you can focus your efforts

Observations on Central and Eastern Montana

- Large geographic area
- Small, dispersed population
- Water
- Electricity

A Different Way of Looking at Things

- “Farming the Sun”
- Sun + plants + 1 Million years = fossil oil
- Sun + plants + 1 Million years = coal
- Sun + tree + 80 years = firewood
- Sun + agricultural crop + a growing season = ethanol, biodiesel, etc.
- Sun + earth’s rotation = wind = electricity
- Sun + snap your fingers = PV electricity

The background of the slide is a dense field of autumn leaves in various shades of red, orange, and yellow. A semi-transparent blue rectangular box with a thin black border is positioned in the upper half of the slide. Inside this box, on the left side, is a faint, light blue silhouette of a deciduous tree. The text "GOODFELLOW AGRICOLA CONSULTANTS INC" is written in a white, serif, all-caps font across the center of the blue box.

GOODFELLOW AGRICOLA CONSULTANTS INC

The background of the slide is a dense field of autumn leaves in various shades of red, orange, and yellow. A semi-transparent white rectangular box with a thin black border is positioned in the lower half of the slide. The text "Thank you. Questions?" is written in a black, sans-serif font across the center of the white box.

Thank you. Questions?